

Attorney Docket No.: 08048.0018-00000

Customer No.:



22852

PATENT TRADEMARK OFFICE

**UNITED STATES PATENT APPLICATION**

**BY**

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**FOR**

**PRODUCT APPLICATION DEVICE INCLUDING A DIP TUBE**

08048.0018-00000

[001] The present invention relates to a device for packaging and applying a product, for example, a care product or a cosmetic product such as a perfume. The device may comprise a receptacle configured to contain the product, an applicator element, and a dip tube to allow product to flow from the receptacle to charge the applicator element.

[002] There exists a need for a packaging and applicator device having a structure that is relatively simple, and that enables an applicator element to be filled easily with a relatively large quantity of product. There also exists a need for a device that is capable of containing a product that may have a low viscosity, such as, for example, a perfume, while limiting the risk of leakage in the event of the device being tipped over accidentally.

[003] Optionally, the present invention satisfies one or more needs and/or overcomes one or more shortcomings.

[004] According to an exemplary aspect of the invention, a device may comprise at least one receptacle having a variable inside volume being configured to contain a product. A dip tube may be provided in the receptacle. At least one enclosure may be provided that is suitable for taking up a substantially closed configuration and suitable, when in the substantially closed configuration, for containing an applicator element. The enclosure may also be suitable, when in the substantially closed configuration, for being put into fluid communication with the receptacle via the dip tube.

[005] The terms “substantially closed” and “substantially leak-proof” as used herein are intended to define a state of the device whereby a product seal is provided by the portion(s) of the device in the “substantially closed” or “substantially leak-proof” state. For example, when the product is a liquid, this seal could be a liquid tight seal. This product seal is intended to exist when the device is used in a manner consistent with the disclosure contained herein so as not to allow product to flow out of sealed portion(s) of the

device. Optionally, this “substantially closed” and “substantially leak-proof” state may also at least inhibit the free flow of gas out of the device and/or provide an airtight arrangement whereby air does not normally enter through this “seal” at all.

[006] Exemplary embodiments of the invention may be configured to enable the applicator element to be filled while the enclosure containing it is substantially closed. As a result, product flowing into the enclosure might tend to generate a pressure rise opposing further ingress of the product. This might make it possible to prevent product penetrating into the enclosure too quickly or in too great a quantity, which could, for example, lead to an applicator element being soaked excessively with product. Furthermore, it might be easier to control the amount of product that is taken up from the receptacle, for example.

[007] According to another optional aspect of the invention, the device can comprise at least one receptacle of variable inside volume configured to contain a product. The device may have at least one housing for receiving an applicator element and also at least one closure element for substantially closing the housing. The device may further comprise at least one applicator element suitable for being contained in the housing when the closure element is in place to substantially close said housing, and a dip tube enabling the housing to be fed.

[008] According to another optional aspect of the invention, the device may comprise at least one receptacle having variable inside volume including a dip tube and being configured to contain a product. Further, the device may include at least one removable unit suitable for housing an applicator element and suitable for being put into fluid communication with the receptacle, wherein the product is delivered to the removable unit via the dip tube. Additionally, the applicator element may be suitable for being

contained in a substantially closed space inside the removable unit when the removable unit is in fluid communication with the receptacle.

[009] In an exemplary embodiment of the invention, the receptacle may be suitable for responding to actuation by passing from a first configuration in which the receptacle presents a first inside volume to a second configuration in which the receptacle presents a second inside volume smaller than the first, the transition from the first configuration to the second generating pressure inside the receptacle suitable for forcing the product to rise into the housing via the dip tube.

[010] In other words, according to this optional aspect, the housing may be fed directly with product by the dip tube, and without an intermediate pump. Thus, when the receptacle has a wall that is compressible, squeezing the receptacle may cause the product to rise into the housing and feed the applicator element with product. Thus, there may be no need to turn the receptacle upside-down in order to fill the applicator element with product, and the receptacle may be used in an upright position while filling the applicator element with product.

[011] In an optional aspect, the device may comprise a receptacle having a variable inside volume configured to contain product, an applicator element and a housing for receiving at least part of the applicator element. The device may also include a closure element configured to close the housing in a substantially leak-proof manner when the applicator element is received at least partially in the housing and also a dip tube configured to extend substantially to the bottom of the receptacle. The dip tube may be configured to enable the housing to be in flow communication with product flowing from the receptacle.

[012] According to another optional aspect, the device may be configured to allow a reduction in the variable inside volume of the receptacle from a first volume to a second volume smaller than the first volume. This reduction from the first volume to the second volume may generate pressure inside the receptacle for causing product to flow into the housing via the dip tube.

[013] In an optional aspect, the product application device may comprise a receptacle having a variable inside volume configured to contain product, an applicator element, and a dip tube configured to extend to the bottom of the receptacle. The device may further comprise a first portion and a second portion configured to cooperate together to define a substantially leak-proof enclosure for the applicator element. The dip tube may also be configured to enable the enclosure to be in flow communication with product flowing from the receptacle.

[014] In one aspect, the first portion may comprise a housing for receiving at least part of the application element, and the second portion may comprise a closure element configured to close the housing.

[015] According to another optional aspect, the first and second portions may cooperate to define a removable unit. The device may also comprise a third portion located on the receptacle, wherein the removable unit may be configured to be removably associated with the third portion. In addition, the dip tube may be connected to the third portion.

[016] In an optional aspect, the device may further comprise a closure element for closing the third portion when the removable unit is not associated with the third portion. This third portion may be configured to be in flow communication with the variable inside volume via the dip tube. The third portion may optionally comprise a sleeve having an

open end through which at least a part of the removable unit passes and another end placed in flow communication with the variable inside volume via the dip tube. In an alternative aspect, the third portion may comprise a protrusion for mating with a mating opening located at an end of the removable unit.

[017] The structure of the device of the invention may be relatively simple, thus making it possible to ensure substantial reliability in operation while maintaining a cost price that is relatively low. The invention also may make it possible to limit the risk of product leaking out in the event of the device being accidentally turned upside-down because the dip tube may slow down or even completely prevent flow of product to the outside of the device.

[018] In another optional aspect, the level to which the receptacle is filled with product may be selected in such a manner that prior to first use the end of the dip tube that opens out into the bottom of the receptacle lies above the level of the product when the receptacle is turned upside-down. Thus, if the receptacle is turned upside-down, the product may not flow out, thus reducing the risks of leaks.

[019] In another optional aspect of the invention, the dip tube may open out into the bottom of the housing receiving the applicator element. The wall defining the end of the housing may be substantially planar or may also be concave towards the applicator element, thus making it possible to drain any excess product back towards the dip tube.

[020] In an optional aspect of the invention, the dip tube may be a separate attachment that may be fixed on an end-piece formed integrally with an end wall of the housing. In a variant aspect, the dip tube may be formed integrally with the end wall of the housing.

[021] The applicator element may also be removable, or in a variant it may be permanently fixed within the housing. If the applicator element is removable, it may form part of an applicator that also includes a handle. In an optional aspect of the invention, the applicator element may be removable and suitable for bearing against the end wall of the housing when the applicator is in place on the receptacle.

[022] In another variant aspect, the applicator element and the end wall of the housing may be shaped so as to define a gap therebetween when the applicator element is in place on the receptacle. In this aspect, product may accumulate in the gap. The applicator element may thus present a recess in at least a portion of its surface that faces towards the end wall of the housing and product may accumulate in the recess, at least when the housing is fed with product. The end wall of the housing may also present a recessed portion going away from the applicator element.

[023] In another variant, the end wall of the housing may present an annular rim against which at least a portion of the applicator element may come in to contact. The housing may also have an intermediate wall situated between the applicator element and the product inlet into the housing.

[024] The housing may also include a pad made of porous material such as, for example, a foam material placed on the end wall of the housing and against which the applicator element may rest.

[025] In another optional aspect, the applicator element may be removable and form part of an applicator that also includes a handle. The applicator element may thus be received in a removable unit suitable for being fixed temporarily on the receptacle in order to be filled with product. The removable unit may also be compact and easily carried, for example in a handbag, during the day.

[026] In another optional aspect, the removable unit may comprises a body suitable for co-operating with the handle of the applicator in such a manner as to form an inside space in which the applicator element is contained, the space preferably being substantially leak-proof with respect to the product.

[027] The handle and the body of the removable unit may co-operate, for example, by screw fastening. In addition, at least one of the handle and the body of the removable unit may include a sealing skirt.

[028] By way of example, the removable unit may include a check valve enabling product to flow under pressure from the receptacle into the inside of the removable unit.

[029] In an optional aspect, the device of the invention may include a closure member for closing the housing of the receptacle when not in use. When the receptacle housing receives a removable unit as explained above, the closure member may be brought into its closed position after the removable unit has been removed. This closure member may constitute a hinge lid, for example.

[030] According to another optional aspect, the applicator element may be compressible. The applicator element may comprise a foam of a plastic material such as polyurethane, polyester, polyether, polyvinyl chloride (PVC), or nitrile butyl rubber (NBR), although this list is not intended to be limiting. The applicator element may also comprise, for example, a sintered element made at least partially of, for example, polyethylene, PVC, ethylene vinyl acetate (EVA), polyamide, or brass.

[031] The applicator element may also comprise a felt material.

[032] In an optional aspect, the receptacle may have a flexible wall. The receptacle may optionally include a bellows. With the inclusion of a bellows, the dip tube may be secured to a portion of the receptacle situated above the bellows, so as to move



downwards with said portion when the bellows is compressed and reach the bottom of the receptacle, or come close enough thereto to enable it to dispense product.

[033] The product may also be contained in a flexible bag forming a receptacle, whereby the bag may be contained in a case in which it is possible to generate pressure that is higher than the pressure that exists inside the bag. The case may also comprise a check valve for allowing gas to pass into the case as product is removed from the bag.

[034] In another optional aspect, the device may be part of a product application system. The application system may include at least one additional receptacle comprising a variable inside volume configured to contain product and a dip tube configured to extend to the bottom of the additional receptacle. The dip tube of the at least one additional receptacle may be configured to enable the enclosure to be in flow communication with product flowing from the at least one additional receptacle. In addition, the system may comprise product in the receptacles, wherein each of the receptacles contains a differing product.

[035] As mentioned above, the invention may be suitable for applying a perfume, which can be applied precisely and in a manner that may give rise to a great feeling of freshness.

[036] The accompanying drawings are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification. The drawings illustrate exemplary embodiments of the invention and, together with the description, serve to explain certain principles. In the drawings,

[037] Fig. 1 is a cross section view of a device according to a first exemplary embodiment;

[038] Figs. 2 to 6 show cross section views of alternate top portions for the Fig. 1 device;

[039] Fig. 7 is a fragmentary cross section view of a second exemplary embodiment;

[040] Fig. 8 is a fragmentary view, partially in cross section, showing a third exemplary embodiment;

[041] Fig. 9 is a cross section view of a removable unit of Fig. 8;

[042] Figs. 10 and 11 are cross section views of fourth and fifth exemplary embodiments, respectively;

[043] Fig. 12 is a cross section view showing an alternative embodiment of a removable unit; and

[044] Figs. 13 and 14 are perspective views of embodiments of an application system having a removable unit and a plurality of receptacles.

[045] Reference will now be made in detail to exemplary embodiments of the invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers are used in the drawings and the description to refer to the same or like parts.

[046] Fig. 1 shows a packaging and applicator device 1 of the invention, comprising a receptacle 2 having a tubular wall 2a about an axis X and a bottom end wall 2b. The tubular wall 2a may be made of flexible material so as to be elastically deformable. It is thus possible to reduce the inside volume of the receptacle 2 by squeezing the tubular wall 2a, e.g. between finger and thumb.

[047] The receptacle 2 may contain a product P, e.g. a liquid having very low viscosity such as a perfume. The top of the receptacle 2 has a neck 5 defining a housing 7

for receiving an applicator element 10. The applicator element 10 is secured to a handle 11 that also constitutes a cap for substantially closing the neck 5. In the example described, the applicator element 10 comprises a foam material.

[048] The handle 11 has a sealing skirt 12 suitable for bearing in substantially leak-proof manner against the inside surface of the neck 5. The handle 11 also has an outer skirt 13 provided with a thread suitable for screwing onto a complementary thread formed on the outside surface of the neck 5.

[049] The neck 5 has a bottom end wall 20 provided on its underside with an end-piece 21 for fixing a dip tube 22. The end-piece 21 opens out into the housing 7 via an orifice 24. The dip tube 22 extends from the end-piece 21 to the end wall 2b of the receptacle 2.

[050] In the example of Fig. 1, a substantial portion of the bottom surface of the applicator element 10 comes in contact with the end wall 20. To use the device 1 with the receptacle in a head-up position, the user may squeeze the tubular wall 2a so as to reduce the inside volume of the receptacle 2, thereby causing product P to penetrate into the housing 7 via the dip tube 22.

[051] The product P flowing along the dip tube 22 may come into contact with the applicator element 10, which becomes filled with product P, at least in the vicinity of the orifice 24. Thereafter, the user may withdraw the handle 11 and may bring the applicator element 10 into contact with a desired surface, such as, for example, regions to be perfumed.

[052] In the event of the receptacle 2 being turned upside-down accidentally, the end 23 of the dip tube 22 may emerge above the product P, so that product does not flow into the housing 7.

[053] Fig. 2 shows a device which differs from that described above only in the shape of the applicator element 10'. This applicator element has a concave recess 25 in its surface that faces the end wall 20. The recess may cooperate with the end wall to define a gap 26 in which the product P may accumulate. The applicator element 10' may thus be easier to fill with product.

[054] To improve the way in which product is distributed over the applicator element, it is possible to place an intermediate wall, or grid, 30 that is pierced by a plurality of orifices 35 inside the housing in the manner shown in Fig. 3.

[055] In another variant, shown in Fig. 4, the end wall 20 has a downwardly-directed recessed portion 40 leaving an empty gap 41 relative to the applicator element 10. In yet another variant, the end wall 20 has an annular rib 45 surrounding the orifice 24, as can be seen in Fig. 5. When applicator element 10 comes in contact with the annular rib 45, the applicator element 10 may be spaced apart from the end wall 20 thus leaving an empty gap 46 relative thereto.

[056] In yet another variant, a pad 48, shown in Fig. 6, is placed on the end wall 20. This pad may be made of a foam material and the applicator element 10 may come in contact with or come to bear against the pad as shown in Fig. 6. The pad 48 may serve as a reservoir for the product. This reservoir may serve not only to improve distribution of the product over the applicator element 10, but also to prevent any substantial leak of product when the applicator element 10 is withdrawn. In all the embodiments described above with reference to Figs. 1 to 6, the applicator element may be removable.

[057] It would not go beyond the ambit of the present invention, however, for the applicator element to remain secured to the receptacle. By way of example, Fig. 7 shows a

device 50 comprising a receptacle 51 having a compressible wall and provided at its top end with a neck 52 on which a support 55 is fixed by snap fastening.

[058] The support 55 has an end wall 61 provided with a chimney 60 extending through the end wall. The bottom portion 60a of the chimney, situated beneath the end wall 61, has an inside shoulder 62 and may be used for fixing a dip tube 63. The top portion 60b of the chimney 60 situated above the end wall 61 has an outlet orifice 64.

[059] The end wall 61 supports an applicator element 65 that is fixed to the end wall 61 by, for example, adhesive or heat-sealing. The applicator element 65 may be constituted by a sintered element, for example. The support 55 has an assembly skirt 68 provided with an outside thread suitable for co-operating with a complementary thread formed on the inside surface of a closure cap 69. The device 50 may be used by squeezing the receptacle 51 with the applicator element 65 on top, thereby feeding the applicator element 65 with product. Thereafter, squeezing of the receptacle 51 may be released. The receptacle may optionally be tilted during application, with the receptacle then serving as a handle.

[060] The applicator element according to any of the embodiments disclosed herein may form part of a removable unit, suitable for being refilled periodically by means of a receptacle provided with a housing and a dip tube like those described above. Figs. 8 and 9 show such a removable unit 85. The unit is intended to be refilled by means of a receptacle 71 having a compressible wall, and having a neck 72 in which an insert 73 is fixed to define a housing suitable for receiving the removable unit 85 when it is to be refilled.

[061] The insert 73 has a hinged lid 75 secured thereto for the purpose of closing the housing 74 when the removable unit 85 is absent. The end wall 76 of the insert 73 has

an end-piece 77 for fixing a dip tube 78. An annular setback 81 is formed in the end wall 76.

[062] The removable unit 85 comprises a bottom portion 86 and a top portion 87 that are assembled together by screw fastening. The removable unit 86 houses an applicator element 106 that may be fixed to one end of an assembly skirt 105 of the top portion 87. The applicator element 106 and the top portion 87 may constitute an applicator member that can be separated from the bottom portion 86, for example, at the time of application. The top portion 87 may then serve as a handle.

[063] The top portion 87 has a sealing skirt 100 suitable for bearing in a substantially leak-proof manner against the bottom portion 86 when the removable unit is closed, as shown in Fig. 9. The bottom portion 86 has an end wall 91 pierced in its center by an orifice 89. An annular lip 88 extends downwards around the orifice 89 so as to bear in a substantially leak-proof manner against the inside edge of the annular setback 81 of the end wall 76, thus enabling a substantially leak-proof communication between the end-piece 77 and the orifice 89.

[064] A check valve 90 made of, for example, an elastomer material overmolded on the end wall 91 enables the orifice 89 to be substantially closed when, for example, the removable unit 85 is not being refilled. The check valve 90 comprises a central portion forming a shutter that is connected by bridges of elastically deformable material to a peripheral portion 97 that is secured to the end wall 91.

[065] To refill the removable unit 85, the unit may be put into place in the insert, or sleeve 73, until the sealing lip 88 comes to bear in a substantially leak-proof manner against the inside edge of the setback 81. Thereafter, the wall of the receptacle 71 may be

squeezed, causing product to rise via the dip tube 78 with sufficient pressure to lift the check valve 90 off its seat.

[066] Naturally, the invention is not limited to the embodiments described above. For example, the receptacle and the applicator element may be of different shapes. As shown in Fig. 10, the receptacle may include a bellows 120 about the axis X. When the top portion 121 of the receptacle is moved downwards, the inside volume of the receptacle may decrease and pressure may be generated.

[067] A dip tube 122 may put the housing 7 into communication with the inside volume of the receptacle. The bottom end 124 of the tube may move towards the bottom end wall 125 of the receptacle when the bellows 120 is compressed. Once the bellows has been compressed, the end 124 may be located at the bottom 125 or may be sufficiently close thereto to ensure that substantially all of the product contained in the receptacle may be dispensed.

[068] The product may also be contained in a flexible bag 130 placed inside a case 131, as shown in Fig. 11. The case 131 may be elastically deformable so as to enable a user to generate pressure around the bag 131. This pressure may serve to expel product via a dip tube 132. The case 131 has a check valve 133 that may be closed when the pressure inside the case is positive, but that may be suitable for opening when the pressure inside the case is negative. The decrease in the space occupied by the bag 130 as the product contained inside it is progressively expelled may thus be compensated by air penetrating into the case through the valve 133. The valve 133 may be overmolded on the case 131 as shown in Fig. 11.

[069] Fig. 12 shows an example of a removable unit 230 having a feature whereby it includes an application element 230 that is carried by an element 232 connected via a

film hinge 233 to a body 234 of the removable unit. The body 234 defines a cavity 235, for example, a generally concave cavity. The cavity 235 may be configured for receiving the element 231 when the lid 232 is in place on the body 234 to substantially close the cavity 235. By way of example, the lid 232 may include a sealing lip 236 suitable for pressing in a substantially leak-proof manner against the body 234. The wall 239 defining the bottom of the cavity 235 may define an orifice 237 that is suitable as a mating opening for mating with a portion of a receptacle. While the removable unit 230 is not being filled with product, the orifice 237 may be substantially closed, for example, by a check valve 238.

[070] The removable unit 230 may be used in a similar manner as the removable unit described with reference to Fig. 8, or it may also be used with a receptacle as described below. The lid 232 may be opened so as to allow the element 231 to be brought into contact with a surface on which the product is to be applied.

[071] As shown in Figs. 13 and 14, it also may be possible to use a removable unit 300, such as one of the units described above, not merely with a single receptacle, but with a plurality of receptacles 301a, 301b, 301c, 301d (in an example where there are four such receptacles). Each of the plurality of receptacles may be provided with a respective dispensing protrusion 302, for example, which is capable of being in flow communication with a respective receptacle dip tube (not shown).

[072] The removable unit 300 may be suitable for cooperating temporarily with any one of these receptacles in order to transfer a certain quantity of a product from the receptacle into the applicator element contained within the removable unit.

[073] Each of the receptacles 301a, 301b, 301c, and 301d may thus contain, for example, a different product. For example, each may contain a perfume that corresponds to a particular scent, and the user can select a receptacle as a function of the scent the



user desires to wear on any particular day. By way of example, the receptacle 301a can contain a given perfume while the receptacles 301b to 301d can contain amber, woody, or floral varieties of the perfume, respectively.

[074] The user also may fill the removable unit with a plurality of different products by connecting the removable unit temporarily to a plurality of receptacles in succession, depending on which products the user desires to transfer into the removable unit. The user may thus make up mixtures of scents, preparing a perfume "*à la carte*", as it were.

[075] By way of example, the receptacles 301a to 301d can be contained in a single box 303, or they can be held on a common support, with the support being something other than a box.

[076] The receptacles can contain products other than perfumes. For example, they can contain creams, lotions, or other products for applying to skin, hair, fingernails, toenails, or other surfaces. Such products could be cosmetic products and/or treatment products. For example, the product could be in liquid form, cream form, or foam form.

[077] The removable unit 300 can be associated, for example, with a receptacle 303a containing sunscreen, a receptacle 303b containing vitamin C, a receptacle 303c containing vitamin A, and a receptacle 303d containing salicylic acid, and naturally the number of receptacles is not limited to four and could be greater or smaller.

[078] It will be apparent to those skilled in the art that various modifications and variations can be made to the structure. Thus, it should be understood that the invention is not limited to the examples discussed in the specification. Rather, the present invention is intended to cover modifications and variations.